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This IRCD Bulletin issue contains two papers. One, by Harold L. Cohen, summarizes two of his previously prepared papers in which he discusses his approach to learning behaviors. He describes the use of reinforcements as motivators for academic and social learning at a Federal correctional institution. Cohen states that "The design and use of new schedules of reinforcement in a contingency oriented environment, the use of programed instruction, and a design of a new curriculum produce academically competent youngsters who now recognize that they are becoming successful in an area which for them was previously failure. This is no longer a laboratory theory but a proven fact." The second paper, by Joan D. Gussow, reviews the theory of operant conditioning and relates it to education. Discussed are some applications and techniques of contingency management. In rebuttal to those who raise a moral issue about the application of conditioning theory to education, she notes that it can be viewed as "a technology, a tactic, capable of helping us reach our strategic educational goals." A selected bibliography on the experimental analysis of behavior is included. (NH)

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THE EDUCATIONAL MODEL *

Harold L. Cohen †

When a chemist wishes to study the reaction of two elements, he controls not only the quantity and state of his material but the time and place that they are joined. Because of this measured and controlled procedure, he can write a formula which becomes subject to further tests. Should this new formulation hold under further rigorous experimental control, then a physical truth can be postulated.

In human behavior, we can have something which initially looks like a similar procedure but which certainly is not. Even if we could identify all the elements that we felt were involved in this multistructured compound called man, describe the total compound, and methodically measure and describe the environment, we could not predict accurately the behavior. For human behavior is the result of an interaction between stimulus events and an organism which already has a behavioral history; a given environment affects individuals differently because the individuals themselves have been differentially shaped and reinforced.

The action of environmental stimuli upon individual behavior and the individual's reaction to these stimuli produce a change in the individual. This change is called learning. As an educator, I am interested in the production and maintenance of learning behaviors. Learning behaviors are not isolated in a vacuum, for learning is growth, and growth must be maintained by an environment. In order to grow, a plant is sustained by solar energy, rain, and earth's chemistry, as well as by other flora and fauna which may not only add to its growth but in certain cases also provide for its death and decay. There is also an ecology which can sustain learning. The design and measurement of these ecologic essentials and the technologies required to maintain them are my concern.

Although a free society has many environments that sustain learning, my research associates from the Institute for Behavioral Research and I have gone to an artificial laboratory (to a federal correctional institution—a relatively controlled environment) in order to study those factors that can change and maintain learning behaviors. In the past two years, we have been involved in the development of a special education project at the National Training School for Boys, Washington, D. C. In our most recent project, CASE II—MODEL (Contingencies Applicable to Special Education—Motivationally Oriented Designs for an Ecology of Learning), we have 28 young juvenile offenders from east of the Mississippi River. We have one homicide, three rapists, and two armed robbers, and the rest are an assortment of general housebreakers and automobile thieves. Whether they be white or black, from the hills of West Virginia, the streets of New York, the suburbs of New Orleans, or the farms of Tennessee, they all have two things in common: 1, they were all caught by an officer of the law and sentenced by a judge to prison; and, 2, they were all school failures. 85 percent of these youths were dropouts from school. The 15 percent that were still in school when sentenced were retarded, from three to six years, according to their Stanford Achievement Test scores.

Although the existing system of education at NTSB was to select only those who looked potentially promising and to give them the standard public school approach, we, in the CASE project, took them at all levels, even those who did wish to go to school. We accepted every breathing inmate as sound student material, and we started our educational research project with all 28. Part of our research objective is to establish a curriculum for educational therapy, to augment the individual's present repertoire as revealed by objective measurement. We do not design educational programs based upon the individual's past history, upon what he says he does, or upon what other people think he wants to do. The interview given to each individual when he enters the CASE project, and the case history we receive about a week later, are used only as a means of assisting us in beginning to get acquainted with the youngster. His actual educational program is based upon his measured performance on a large series of tests, specific tests in such areas as multiplication, division, subtraction and complex reading tasks, and more general tests such as the Stanford Achievement Test and the Gates Reading Survey.

After the individual has gone through his entry tests and we have been able to identify his deficiencies in specific areas (e.g., long division) and in general areas (e.g., reading), he is given a set of programmed instruction material based upon his present repertoire. Along with these specific programmed instruction units, we start him with programmed texts, seminars, and other course material. In order to be able to do this, we have planned a new curriculum with 80 percent of all our subject matter taught by individual programmed instruction or programmed texts; the other 20 percent by programmed classes.

We have young men who come to us at the age of 17 years who can hardly read the word "their," but they can read numbers. If an individual can read numbers (2 + 2), we start there. By pretesting the students and assigning them programmed instruction at a level where they can successfully perform, we guarantee success for each individual no matter on what level he begins. Thus, each individual is on his own track and becomes programmed for

*This paper is a summary of two combined articles: "Educational Therapy" and "M.O.D.E.L." Part of "Educational Therapy" appeared in Arena: Architectural Association Journal (March, 1967), 34 35 36 Bedford Square, London WC1. The complete article with the addendum will be published by the American Psychological Association, as part of a volume on the Third Conference on Research in Psychotherapy, held at the University of Chicago in June, 1966. "M.O.D.E.L." was a paper given before the American Educational Research Association in February, 1967. It is planned to be part of a collection of essays, The Ecology of Education.

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success in contrast to his past educational environment in which he was basically programmed for failure. Little by little, each student inmate finds out that he is able to perform 90 percent or better in his test work.

Each individual begins to work on his educational material because there is a payoff. Books (regular or programmed) are paper and ink. Films (black and white or color) are cellulose and sound waves, and lectures are "minds pushing out hot sound waves." Books, films, and lectures become meaningful only when there is something in it for the receiver. That "something in it" is the required condition for the first input which is then sustained by a schedule of reinforcement and later maintained by an external reinforcing environment. We all learn because there is something in it for us. We read our books in school and took our tests because there was something in it for us. The "something in it" might have been a job or $5.00 for each "A." Today, for some college students, a grade of "C" or better is the ticket for staying out of Vietnam. Good grades permit some young people to hang around college and socialize. Good grades may permit others to get the degree which then permits them to join their father's business, or IBM's. For some, buying a car, getting married and having children, and going off to Europe are good goals. It also may be that some of us read and learn because we "enjoy it" for the sheer pleasure of it—like the scholar and the Jesuit. But America is not filled with scholars and Jesuits. Although the American ideal is that everyone should perform at his best level and do "good," our Training School students have demonstrated that they have not been maintained by these ideal goals. If we can take as a basic premise that every individual needs to have some payoff, some system of reinforcement, then the question we need to ask is "When, and on what schedule?" Unlike the Jesuit who will wait until his final hour for his reinforcement, God and Heaven, our delinquent student inmates are not willing to wait for good report cards, diplomas, and the rest of the delayed reinforcements. They want to know "Man, what's the payoff now?" For these non-Jesuit types we use an extrinsic immediate reinforcer, money, to get the academic behaviors started. Money—rather than their love of parents, God, and country—is the major initial reinforcer for our students. They, like most of us, are willing to work for money.

The goals of the CASE II—MODEL project are to increase the academic behaviors of all of its students, no matter at what level they are, and to prepare as many students as possible within our one-year time schedule for their return to the public school system from which they dropped. To fulfill this objective, we did not count on their willingness to perform as students. We converted an old facility (an existing cottage on the prison grounds) into a 24-hour learning environment. We created a point economy using money as the generalized reinforcer. We established schedules of reinforcement and hired the students to work for us on some 140 programmed educational courses and 18 programmed classes. Each student becomes, and is addressed as, a Student Educational Researcher, working for the corporation. His product is intellectual wealth in general and academic work in particular. When the students perform on tests at 90 percent or better, they get paid off in points, and each point is equal to one penny (in money). With what he earns, the student pays for his room, his food, his clothing, his gifts, and he pays an entrance fee and tuition for special classes. He can also rent a private office. A student who does not have sufficient funds goes on relief—sleeps on an open bunk and eats food on a metal tray—no student has ever been on relief more than two weeks. We thus created a society full of choices and perquisites normally not available in a prison, but available to the average wage-earning American. A system of time clocks located throughout the building established our basic measurement tool. We set up new evaluation methods for parole based upon objective academic measurements and recordable social behaviors.

In addition to the monetary payoff, specific environmental cues (facilities and signs) help the student to differentiate out his own behaviors. The student offices, upstairs in the educational environment, are solely used for the support of assigned academic tasks. The question is not whether an individual is able to take behaviors such as reading and writing and perform them in other environments, for we know this to be true. The reason for the private office is that the space and the other instructional cues are, at the beginning, a critical reinforcer in the learning chain. In CASE I, learning to do math and respond to programmed instruction started first in the classroom area and was extended into the library and the students' private offices. In CASE II, after a history of success in the educational area, the student can take material into his own private bedroom. In each bedroom area, the students have their desk area which can be closed up at night to become part of their locker and storage system. An individual can work in his own room, writing letters, drawing pictures, making models of cars, doing additional school work. In his room, the student is permitted to sit up all night and read; both the rules and a private lamp, bed and chair in his room, plus his own ability to read, make that behavior possible.

Using money as a generalized reinforcer works in our educational research environment, just as it does in our society. But there are areas of activity which provide types of reinforcement which are equally powerful and in some areas more powerful than money. A young man playing basketball in front of his high school friends sets a difficult basket shot, the girl cheerleaders jump up and down, and the crowd cheers. Money cannot buy that kind of reinforcement. That's what the adolescents refer to as "goodness." This kind of goodness comes out of a specific singular performance in an environment where the successful behavior is immediately reinforced by the peer group.

The young men that we are dealing with at the NTSB have all gone to school at some time. Although most of them are dropouts, some of them still can perform some simple academic skills. Some of them, I am sure, even learned to multiply while in a school classroom. They even might have read Shakespeare. Then they went into their home environment to find that Shakespeare had no meaning, no payoff, when used at home or in the pool hall. Generally, if a young man started to quote Shakespeare in an East St. Louis pool hall, he would not find a very friendly or supportive group. The difference between studying Julius Caesar in East St. Louis or in the Lab School at the University of Chicago is that the Chicago community would tend to reinforce children when they discuss classics, since they consider it a sign of intelligence, even essential for the growth of the young adult. In East St. Louis the question might be asked, "What's Julius Caesar worth? Will this help me get a job? What use does it have with the gang?" The book itself might be worth 50¢ on the open market, but unless there is a group of human beings to reinforce the use of the book for the slum child, then Caesar would die by many hands other than Brutus'.

Group reinforcement is extremely powerful. We attempted to program some of this into the system. For example, not only was the student paid off in points, but when he did well on an exam (earned 100 percent), the staff was instructed to bring the accomplishment to the attention of all the students and say all kinds of good things like "Gosh, that was great," or "Man, that's cool." This is recognition for a task performed. However, one must not approve just any task, but only those that require some competent behavior or a large effort—for the student knows the difference between a task requiring lots of competent behavior to get a job "well done" and a "mickey mouse" task.

The importance of producing a contingency oriented environment which increases academic skills and maintains these newly acquired behaviors is not just to demonstrate and prove a learning theory and develop an educational technology. These newly acquired educational skills act as a program which reinstates in the young deviant the promise that he can be "normal." "Normal" in this case means that he can be successful in an area where he formerly was unsuccessful and, furthermore, that this success will provide him with the ticket to re-enter the mainstream of the Amer-

ican adolescent world—the public school system and the choices of opportunities that follow. If we examine the behavioral repertoire requirements of the American adolescent, we find that America requires a completed high school education as a necessity for industrial success and a college degree for administrative success. The young school dropout is aware of these requirements, and statements made to him such as "Well, you can't read very well, so you won't make high school, but why don't you get a job as a plumber's assistant or a laundry presser?" only reinforces his initial viewpoint—that he is not very bright and is considered by you to be a second-class citizen. If it is "good" and necessary for the free, healthy, nondelinquent adolescent to complete school, read and write and be prepared for a new technological revolution, then it is necessary and "good" for the delinquent and present deviant to have the same goals. We do not lower the requirements of the academic work for these youngsters, for they recognize dropping of standards and something done for an individual with lower intelligence for a second-class citizen. A student already under racial or regional discrimination is further angered by an attempt at lowering standards.

It might be argued that it is unfair to tell a youngster with an I.Q. below 90 that he can learn to read and write and do algebra like the rest of the "healthy" socially adjusted adolescent group. After all, the school system has not been able to get these youngsters to succeed, and his past academic performance should be ample evidence of his inability to pass. The questions may also be asked, "Why establish false hope? Isn't this a false contract?" The completed work in CASE I and the new data available to us in CASE II clearly demonstrate that it is not the youngster who has failed, but the public school system and the ecology that maintains the school system that have failed; that it is not the youngster who is mentally bankrupt, but that it is the public school and the systems that sustain it that are bankrupt. The design and use of new schedules of reinforcement in a contingency oriented environment, the use of programmed instruction, and the design of a new curriculum produce academically competent youngsters who now recognize that they are becoming successful in an area which for them was previously failure. This is no longer a laboratory theory but a proven fact.

BEHAVIORAL MANAGEMENT AND EDUCATIONAL GOALS*

Mark Twain's by now clichéd remark about the weather —to the effect that everybody talks about it, but no one does anything about it—is no longer applicable to the problems of educating disadvantaged children. In addition to our predictive weather maps and charts, we in education now have our full complement of rain dancers and cloud-seeders; and it is almost as difficult nowadays to find an educational problem without a compensatory program as it is to find a newspaper without a weather forecast. Unfortunately, however, our educational interventions have often proved little more effective than our meteorlogical ones, and our methods of predicting disaster are often a good deal more accurate than our techniques for averting it.

Perhaps no one is more frustrated by this fact than a relatively small group of psychologists who firmly believe that they have the tools to make every child learn. These are the men and women whose approaches and technologies have grown largely out of the explorations of B. F. Skinner into learning and behavior, and who, for lack of a better generic term, are referred to as operant conditioners. They have devoted themselves not to understanding the internal sources of behavior but to systematically observing and controlling it; and, as a group, they have an imposing array of data to demonstrate that they can do just that. More than any other group of individuals working in the area of education and psychology, the operant conditioners talk not about causes and prescriptions but about results. "Tell us what you want taught," they say, "and we will teach it."

To many of their colleagues, such open confidence is unjustified if not downright arrogant; but the fact is that, on the whole, it is not their failures, but their successes that are unsettling. If they were wholly unsuccessful, the operant conditioners would be simply one more group of people plugging away at the problems, and probably offending no one as they did so; but to a greater extent than many people would like to believe, they can live up to their promises. The literature cited in the accompanying bibliography is replete with reports of successful cases—of nonwalking mental retardates made to walk, of speechless children made to talk, of stammerers cured, dropouts educated, and kindergartners prepared for first grade in three weeks instead of nine months. Thus, it is pointless to ask whether the technology based on their theory of learning can produce results—it already has. The significant questions are, rather, how are their results achieved and what are the issues, methodological, philosophical, and moral, that their successes raise?

Fundamentally, operant conditioning is based on the quite general notion that behavior is shaped and maintained by its consequences, that is, that any individual comes to behave as he does in a given circumstance because the consequences of that behavior are rewarding (reinforcing) for him, or, alternatively, because the consequences of other kinds of behaviors are punishing. From this foundation, the operant conditioners contend that what is necessary in order to change behaviors is to manipulate their consequences in the environment. A concern with the behavioral environment of the organism, that is, with an analysis of what it is in the environment that the organism is responding to, does not distinguish the operant conditioners from other schools of psychology. What sets them apart is their refusal to speculate about that part of the behavioral environment which they cannot see—i.e., that part of the environment which is inside the organism. They are interested not in how the organism, whether human or infrahuman, works, but in what it does; and they concentrate their attention on observable, and thus demonstrably, manipulable behaviors.

Thus, they would contend that undesirable behaviors may be eliminated by following them with undesirable consequences (e.g., punish Johnny for talking in class) or, preferably, such behaviors may be "extinguished" by removing the positive reinforcers which are maintaining them in the first place (e.g., find out what Johnny "gets out" of talking in class and eliminate that environmental consequence). The former method, which is referred to as aversive control, is well known to teachers and parents everywhere, and has been demonstrated, when applied by laymen, to be variably effective. If the punishment is severe enough, Johnny will probably stop talking in class or jumping on the furniture at home. From the standpoint of the operant conditioner, however, the weakness of the layman's approach is that it is too indiscriminate in its choice of targets and too inconsistent in its reinforcement—that is, the same act is not always followed by the same consequences. When Kansas' Ogden Lindsley[1] trains teachers and families to manage undesirable behaviors in their students or kin, he has them work on one behavior at a time, defining the target behavior—anything from thumbsucking to throwing up—precisely enough to make it measurable. When the behavioral management "trainee" has recorded and graphed the rate of occurrence of that behavior over time—and "approximately one out of every ten behaviors improves with the mere public recording of its occurrence," he is then told to look for resources in the immediate environment which might be used to con-

*This article is, in part, based upon the proceedings of the Conference on The Experimental Analysis of Behavior in the Education of Disadvantaged Children and Youth which was sponsored by Yeshiva University on November 30-December 2, 1966.

[1] For summary of the work of Lindsley and his students, see Holzschuh [1966 (?)].

trol the target behavior. One teenager "cured" his five-year-old sister's thumbsucking by making her wear a glove for half an hour each time she sucked her thumb. A teenage girl reduced her boyfriend's swearing by repeating each swear word he said twelve times immediately after he uttered it. Thus, under the guidance of operant conditioners, laymen can become better at aversive control; but the price of such control, like the price of freedom, is eternal vigilance. For this reason, aversive control is uneconomical. Behaviors which are punished out of existence will tend to recur when the punishment stops unless desirable alternative behaviors have been simultaneously reinforced. And while aversive control, consistently applied, may be successful as a way of eliminating unwanted established behaviors, it has proved to be of little use in introducing desired new behaviors—especially academic ones. Indeed, it is virtually impossible, as generations of teachers have found, to punish a child into learning reading or mathematics.

Aversive control in the classroom, whether it is physical or whether it is psychological in the form of criticism or failure, is more likely to teach escape behaviors, such as dropping out, than academic ones. Punishment tends to generalize in unpredictable and uncontrollable ways. The child who is continually corrected for saying "mouf" instead of "mouth" may learn not to alter his pronunciation but to stop talking altogether. "It has been clear for some time that many of the ills of human behavior came from aversive control," Charles Ferster (1966) has written.

The operant conditioners who are concerned with education, therefore, have emphasized positive reinforcement and its use in shaping and maintaining new and desired behaviors. The basic techniques are derived from the work of Skinner, the originator of the term operant conditioning and probably its best known proponent. Working with infrahuman species, Skinner demonstrated conclusively that appropriately timed food reinforcements, delivered to a hungry animal and contingent upon his producing some desired piece of behavior, could be used to train rats, pigeons, and other "dumb" animals to emit a variety of complex performances of which ping-pong playing among pigeons was merely one of the more spectacular examples. In order to shape such a complex behavioral sequence in a pigeon, or a comparably complex one in a child, the behavioral manager works in small steps, providing immediate and regular reinforcement for progressive small approximations to the desired behavior. Thus, Stanley Sapon (1966), in shaping verbal behavior in a nonspeaking child, may first reward merely attention to the experimenter's voice, progressing from there to rewarding appropriate mouth movements, thence to rewarding even remote approximations of the desired sound, and so on, until ultimately the child is reinforced for saying "mama."

Though much early work with children, as with animals, has used food, or tokens which can buy food, as a reinforcer, Sapon has found that the ability to "move the world around" by his own language becomes highly reinforcing to a child learning to speak—that if a child says, "I wanna puppy," and the world, i.e., an adult, responds appropriately, that response is reinforcing. Indeed, as operant conditioning has moved from the animal laboratory into the human laboratory, it has become evident that there is an almost unlimited variety of objects and events that can be reinforcing to a behaving human. However, as Skinner (1961) has pointed out, mere provision of a reward, any reward, is not enough to promote academic learning. "Texts garnished with pictures in four colors, exciting episodes in a scientific film, interesting classroom activities—these will make a school interesting and even attractive. . .but to generate specific forms of behavior these things must be related to the student's behavior in special ways. Only then will they be truly rewarding or, technically speaking, 'reinforcing'."

The notion of rewarding successful performance is not alien to the traditional classroom, but rewards are often distributed only for a successful total performance, not for successively close approximations to the "right" answer. The child who has five math problems out of 20 right and 15 almost right is more often made aware of his failure than of his accomplishment. Moreover, reinforcers delivered to an entire class may unintentionally be rewarding not academic behaviors, but merely "behaving." As Lloyd Homme has pointed out,[2] the teacher who says to her class, "As soon as math period is over you can go out to play," has the right tune but the wrong lyrics. The child who is merely sitting and doodling with his pencil will have his behavior reinforced by play period just as effectively as will the one who is working away at his problems. It is much better, says Homme, for the teacher to say, "When you have finished X number of problems you can go out to play."

The traditional reinforcers for school learning are promotions, grades, being right when called on in class, and parental and societal approval for all of these things. Ultimately, the goal of education is that the learner should come under the control of "progress in the subject matter" (Ferster, 1965) as a self-renewing reinforcer. But as Harold Cohen points out in his article in this bulletin, many learners, especially those with an early history of failure in achieving short-range successes, are not sustained by these ideal goals. In his program, Cohen has used money as a generalized reinforcer to promote academic behavior in delinquent juveniles and, in addition, has structured the physical environment so that it too becomes reinforcing to appropriate social and academic behaviors.

But as Homme pointed out in Vol. II, No. 4A of the Supplement to the IRCD Bulletin, there are many other reinforcers available to a teacher in addition to money or M & M's. In his contingency management system derived from operant conditioning, Homme has found that he can use any high probability behavior as a reinforcer. The method is based on a principle first put forth by David Premack (1965) to the effect that "for any pair of responses the more probable one will reinforce the less probable one." What this means in practice—and Homme has used it with ordinary three-year-olds, with adolescent "street kids," and with Indian kindergartners, among others—is that the teacher, or experimenter, merely observes the individual subject in order to discover what behaviors he or she is likely to engage in by choice at any given moment. The "contingency manager" then makes a verbal contract with the subject to the effect that if the subject will perform "X" amount of a designated low probability behavior (e.g., sitting and looking at the blackboard), he may then engage for a specified time in a high probability behavior which he has selected (e.g., running and screaming). Homme has designated high probability behaviors "reinforcing events" and has discovered in practice that those events which students find reinforcing may be quite unexpected. Among a group of dropouts whom he was trying to put through programmed instruction in reading and mathematics, the opportunity to study Russian turned out to be a high probability behavior. Similarly, Cohen (1966) found that the chance to take algebra would reinforce a number of prerequisite mathematical behaviors among several of the delinquent juveniles in his program. While certain reinforcing events (e.g., having a smoke-break) remain relatively stable over a period of time for mature subjects, Homme has found preschoolers less predictable. A young child will not always find reinforcing at the end of his required performance the same event that he selected before performing it. For these changeable children, Homme (1966) has devised a Reinforcing Event Menu on which a variety of activities, from getting a drink of water to pushing the experimenter around in a castor-equipped chair, are portrayed in pictures. From this, the child has merely to choose his own reinforcer after he has completed his assigned task. With his contingency management system, Homme believes that he has solved the problem of motivation—that is, the question of just how one first gets the subject to emit the behavior that is to be reinforced; but he warns that reinforcement must not be

2 Lloyd Homme, from the unpublished proceedings of the Yeshiva University Conference on The Experimental Analysis of Behavior in the Education of Disadvantaged Children and Youth (November 30-December 2, 1966).

reserved only for a perfect performance, and that, in fact, "the difference between an excellent contingency manager and a not-so-excellent one is a willingness to reinforce approximations early in the game."

It is no doubt already obvious that the principal technical problem which the operant conditioning methodologies present is that they require, for at least part of the time, an effective one-to-one relationship between the learner and the teacher. Thus, whatever their record of success in the laboratory, their practical application in the classroom appears at first glance to be limited by their ravenous appetite for personnel. In the case of behavioral problems, Lindsley has attempted to overcome this difficulty by training parents, whose numerical ratio to children is most favorable, to apply behavioral management techniques. The most effective solution, however, has grown out of the awareness that a one-to-one teaching-learning relationship does not imply a person-to-person one so long as the child is in one-to-one contact with a teaching-learning sequence. It is, thus, no particular surprise that it is the father of operant conditioning, Skinner, who is also the father of programmed learning. For ideally programmed instruction, whether conducted by a machine or by a text, establishes the desired one-to-one relationship between the program as teacher and the student as learner. It is a relationship, furthermore, in which reinforcement is frequent, approximations are rewarded, and failures are private. While we cannot here examine the relative merits of the various programs, programming methods, and hardware designed to deliver them, it would not be unfair to say that on the whole they have not yet lived up to their promise. Nevertheless, it is clear that in a country enamoured of technology, more reliable teaching machines and more efficient programs to use with them are being and will be developed. That is to say, we will unquestionably come to possess machines which will be highly effective at teaching whatever we program them to teach. Thus, the need for a one-to-one instructional relationsnip implied by operant conditioning techniques will be resolved.

The philosophical problems are less easily dealt with. It is tempting sometimes when we are faced with the marvellous artifacts of the electronic age to play around with them just to see what they can do—and in the end to let their capabilities establish the limits of the problems with which we are concerned. For example, while it is easy and time saving to use a copying machine, we must guard against letting its very availability lead us to make, and thus reciprocally to receive and have to read, copies we could well do without. So it is with programmed learning. It is, or promises unquestionably to be, the most efficient method of conveying certain discrete pieces of information to a child at the child's own pace. But before we can begin to use this capacity effectively, we must decide what it is we wish to convey. Do we wish to teach children to read the alphabet earlier, to train precocious sight readers at four, or to train individuals who will be excellent readers at 15? What are the relationships between these skills, if any, and can over learning a particular skill perhaps result in fixation at a given stage of development with a consequent failure to achieve mastery of a succeeding skill at the appropriate time? Is the child who at four can parrot an explanation of $E = mc^2$ more or less likely than his innocent contemporary to grow up to make a contribution to Einsteinian physics? These are critical questions, and they are questions to which none of us, including the operant conditioners, have the answer. Perhaps the most significant contribution to education which programmed learning methods have yet made is that by promising to teach what they teach so effectively, they have begun to focus our attention on the questions of just what it is we are sending children to school to learn and just what kind of children we are expecting the schools to produce.

Many people, among them those who do not object to programmed instruction, are uncomfortable with the theory which spawned it. Because the very term "conditioning" calls up the specter of Pavlov's salivating dogs, operant conditioning raises for some observers a moral issue. If it is true that the organism, including the human organism, is under the control of his environment, then is he not by extension under the control of those who control his environment and thus no longer a free agent? The implications of the question are interesting. We expect teachers, of course, to control the behavior of the children in their classrooms, just as we expect parents to control the behavior of the children in their homes. We even speak of a good teacher as one who can make children learn in spite of themselves, that is, can control their behavior without their realizing it. But clearly that is not what we mean. For we feel that is somehow immoral for one person to be able to cause another to behave in a certain way unless the second person is aware that he is being acted upon. Indeed, it may be that aversive control has retained its popularity partly because the child by rebelling against it so clearly demonstrates that it has failed. Our lack of alarm over traditional approaches clearly suggests that we are not disturbed by ineffective methods of control only by effective ones. And while it does not resolve that issue, the fact is that the operant conditioner cannot wholly control the behavior of an organism, especially a human organism, if for no other reason than that he cannot be sufficiently omnipresent to control a major portion of the behavioral environment. At least, he cannot do so by any methods acceptable in a free society.

In fact, operant conditioning, like brain surgery, genetic biology, or space travel, is neither good nor bad intrinsically. It is a technology, a tactic, capable of helping us reach our strategic educational goals. But it can help us define those goals only to the extent that effective and efficient teaching will raise questions about what it is we have thought we wanted taught. It would be unfortunate indeed if resistance to the notion of "control" were to result in a neglect of any part of the methodology, both human and technological, that operant conditioning has produced. But it would be equally sad if educators, instead of facing up to the issue which is raised by its present and future successes—that is, the urgent need to define our goals for education—were to become enamoured of its means and substitute them for an end.

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